

## Jingqi Huang

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EDUCATION	<b>University of California, San Diego</b> , La Jolla, California USA M.S., Eletronical and Computer Engineering Overall GPA: 3.71/4.0 <b>September 2018 - June 2020</b>  <b>Beijing University of Posts and Telecommunications</b> , Beijing, China B.S., Internet of Things Engineering Overall GPA: 3.60/4.0 <b>September 2014 - June 2018</b>	
PUBLICATIONS	[C1] Full paper submitted to <i>The 26th Annual International Conference on Mobile Computing and Networking (MobiCom 20')</i> as co-primary author.  [C2] A. Zhou, S. Xu, S. Wang, <b>J. Huang</b> , S. Yang, T. Wei, X. Zhang and H. Ma, "Robot Navigation in Radio Beam Space: Leveraging Robotic Intelligence for Seamless mmWave Network Coverage", <i>in proceedings of ACM International Symposium on Mobile Ad Hoc Networking (MobiHoc'19)</i>  [C3] <b>J. Huang*</b> , S. Wang* (co-primary) and A. Zhou, KPad: Maximizing Channel Utilization for MU-MIMO Systems using Knapsack Padding, <i>in proceedings of IEEE International Conference on Communications 2018 (ICC'18)</i>  [J1] A. Zhou, S. Xu, S. Wang, <b>J. Huang</b> , S. Yang, X. Zhang and H. Ma, "Robotic Millimeter-Wave Wireless Networks", <i>Submitted to IEEE/ACM Transactions on Networking (ToN)</i>	
PAPER IN PREPARATION	[J2] A. Zhou, Z. Zhang, <b>J. Huang</b> , S. Wang, X. Zhang and H. Ma, Towards Robust Millimeter Wave Links under Mobility and Blockage via Efficient Model-driven Beam Steering, <i>To be submitted</i>	
POSTERS	[P1] S. Wang*, <b>J. Huang*</b> (co-primary) and X. Zhang, "Approximating Omni-Directional mmWave Coverage Using an Array of Phased-Arrays", <i>UCSD 5G &amp; Beyond Forum 2019</i>  [P2] R. Zhao, S.Wang, <b>J. Huang</b> and X. Zhang, "5G Millimeter-Wave V2X: A Reality Check", <i>UCSD Research Review 2018</i>	
RESEARCH EXPERIENCE	<b>Demystify milimeter-wave (mmWave) vehicle-to-infrastructure (V2I)</b> (Ongoing) [P2] <ul style="list-style-type: none"><li>• Aim to carry out the first measurement study for mmWave V2I to demystify its feasibility, potential and limitations.</li><li>• According to the unique aspects of mmWave and V2I, we design a throughout experiment plan to characterize link dynamic, impact of codebook and beam management, interference, antenna geometry and etc.</li><li>• Leverage <i>Simulation of Urban Mobility</i> (SUMO) and <i>Wireless Insite</i> to do extensive simulations with traffic models in different environment settings, including urban, suburban and highway.</li><li>• Experiment shows mmWave's capability to provide stable link at a speed over 60 mph.</li></ul> <b>Enable WiFi-like coverage in mmWave network using an Array of Phased-Arrays (APA)</b> [C1, P1] <ul style="list-style-type: none"><li>• Work in submission.</li></ul> <b>Leverage Robot intelligent to enable seamless mmWave network coverage</b> [C2, J1]	

- Aim to overcome the coverage limitation nature of mmWave network and provides seamless room-level mmWave coverage using a robotic relay.
- Design novel algorithms to recover the propagation of the signal path using measured RSS, and then reconstruct the outline of the environment.
- Design an adaptive path planning algorithm that navigates the robot relay in real-time, and statistically maximizes network performance under environment dynamics and the clients self-blockage.
- Implement Romil on a programmable robot, integrated with COTS 802.11ad radios. Our experiments in multi-room environments verify that RoMil can maintain nearly full coverage for an office environment while robot moving area is constrained, and the performance of a robotic relay is equivalent to 4-5 access points to achieve similar performance.

#### **Enable robust mmWave link using model-driven beam steering [J2]**

- Aim to improve mmWave network's low robustness under mobility and blockage with a model-driven beam steering method.
- Employ a reverse-engineering approach to reconstruct spatial channel profiles (SCPs) at new locations using their correlations. Predict the optimal beams directly as the transmitter/receiver moves to new locations, without brute-force beam scanning
- Design a blockage-resilient beam prediction mechanism into the optimization model, to maintain high performance with concurrent mobility and blockage.
- Propose a greedy approximation algorithm to reduce computational overhead involved with the reverse-engineering for user tracking, achieving real-time beam steering.
- Evaluate our design using a reconfigurable 60 GHz testbed along with a trace-driven simulator. Our experiments demonstrate multi-fold throughput gain compared with state-of-the-art under various practical scenarios.

#### **Approximate maximum channel utilization for MU-MIMO systems using Knapsack Padding [C3]**

- Aim to fully utilize the idle channel caused by frame size diversity, in MU-MIMO systems by padding extra users' frames after shorter frames transmission completed.
- Formulate the user padding using a *multi-stream knapsack model*, a variant of the classical knapsack model. Propose a "step-by-step" greedy stream decoupling mechanism to decouple the interstream interference.
- Design the novel *KPad* algorithm that schedules padding users optimally to fully utilize the channel.
- Evaluate KPad using trace-driven emulation with 50 user traces collected by WARP SDR. Extensive evaluation results demonstrate remarkable throughput gain (up to 42%) compared with the state-of-art.

#### **SKILLS**

- Languages: C, Java, C++, Python, Matlab, HTML/CSS, Shell, MySQL, Assembly, L<sup>A</sup>T<sub>E</sub>X
- Platforms: Linux, MacOS, Windows

#### **HONORS AND AWARDS**

**2014-2017** Beijing University of Posts and Telecommunications scholarship